



### Demanding facility

White Sands Test Facility endeavors to make sure systems can withstand the rigors of space flight. Story on Page 3.



### Traveling fellows

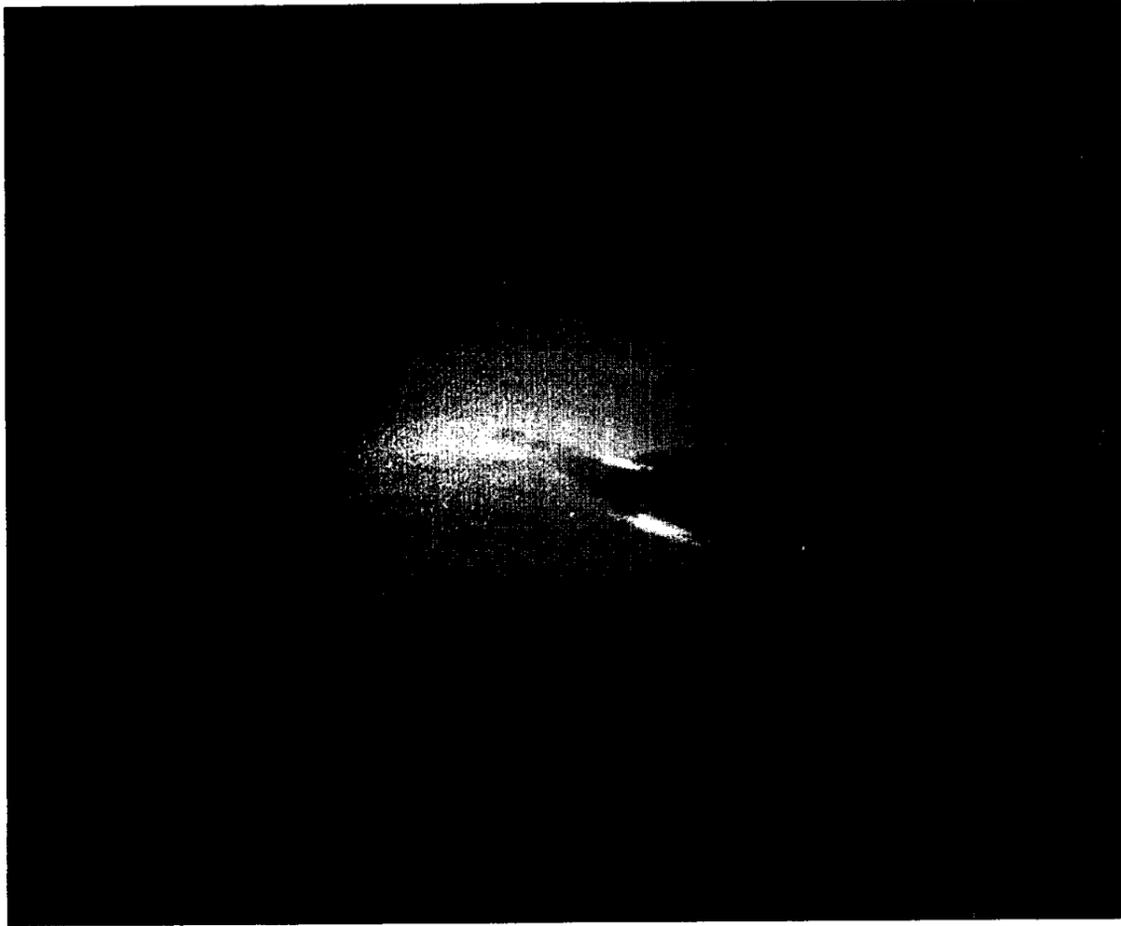
This year's JSC Fellowship Program students are heading for universities throughout the country. Photo on Page 4.

# Space News Roundup

Vol. 28

August 25, 1989

No. 34



## Voyager's finale yields tantalizing Neptune images

By Linda Copley

Voyager 2 began its close encounter with Neptune this week, sending hundreds of images Earthward daily. As the aging spacecraft began its grand finale, it revealed tantalizing details about the planet and its two largest moons that, in some cases, refuted conclusions of just two weeks ago.

The blue planet, thought to be ringless, featureless and cold as Voyager's journey began in 1977, now is known to possess a stormy atmosphere that includes a giant spot similar to Jupiter's Great Red Spot that is, in actuality, a hurricane-like storm about the size of Earth; numerous clouds in the upper and lower atmospheres, and bright "spots" rotating at speeds far faster than the planet's actual 16 to 18 hour "day."

In the past few weeks scientists have discovered a magnetic field around the planet, located four moons to add to the two already known through observations from Earth, and confirmed the presence of previously predicted ring arcs (partial rings).

In the past few days of this ultimate armchair adventure in astronomy, Voyager's images have revealed a smaller, brighter, cooler moon Triton than previously expected, with a pinkish glow. The images, now four hours, six minutes old before reaching Earth, have not yet included an expected aurora similar to the Earth's Northern Lights.

Minute-by-minute information received by NASA's Jet Propulsion Laboratory (JPL) from a spacecraft nearly 2.8 billion miles away now question the presence of the ring arcs "confirmed" only two weeks earlier, leading to scientific speculation that the arcs may actually be part of whole, if faint, complete rings. This would include Neptune with the other outer planets of Jupiter, Saturn and Uranus, as possessing some types of planetary rings.

Expectations among the world's scientists and citizens alike reached its peak Thursday as Voyager, traveling at 42,000 mph, made its closest approach to the irregular-shaped moon Nereid and continued

Please see **VOYAGER**, Page 4

Voyager 2's clear-filter images of Neptune at a range of 9.2 million miles show a dark feature extending northwest from the Great Dark Spot. The puzzling phenomenon developed quickly, and scientists are trying to determine whether it is flowing material from the dark spot or the result of atmospheric disturbances.

NASA Photo

## JSC to debut paper recycling pilot program

By Linda Copley

A pilot program for recycling paper unique to JSC will, if successful, put the center at the forefront of agencywide conservation efforts.

Beginning Oct. 1 and continuing through the first of the year, special supply bins for salvageable used paper will be provided to individual offices in Bldgs. 45 and 227. The paper deposited in these bins will be collected by the contract custodial staff and deposited in a specially designated water-tight dumpsters located at those buildings.

When the dumpsters are full, the contents will be picked up by a contact carrier and shipped to a local paper recycler. The savings that result, minus the cost of transporting the load to its destination, will be realized by JSC in the form of credits on our current custodial contract account with Best Waste Inc., which totals approximately \$200,000 annually.

"We should realize a substantial credit yearly by doing it this way," said Michael Scott, chief of Center Operations' Special Purpose Main-

tenance and Service Office, and co-author of the pilot program.

Acceptable paper for recycling includes computer paper (which has the most value to the mill), ledger paper, photocopies, manuals, and card stock that contain little or no colored ink (pink sheets will not be acceptable). Staples should be removed from documents, and envelopes or anything with a gummed surface should not be included in recyclable stock.

The recyclable-paper bins will be emptied daily, since much of the

trash employees throw away fits that category. Actual trash pickup, however, will then be reduced to an "as needed" basis. "Employees in the affected buildings will want to minimize the amount of food waste they throw away," says Scott, "since the custodial staff won't be emptying their trash cans every day."

The recycling effort, according to Center Operations Director Ken Gilbreath, has been under consideration since 1973. "Up until now we had not found a way of at least breaking even, costwise," he said.

"But now there has never been a time of greater potential for the project, nor has there ever been a more clear need for recycling for the country—or the Earth as a whole," Gilbreath explained.

That realization, along with Technical Assistant for Engineering, Operations, and Safety John Young's memo of last spring extolling the adaptation of conservation programs at JSC "nudging" him along, prompted Gilbreath to form a special group to evaluate the possibilities.

## Retrieval prospects good for time-worn satellite

By Kelly Humphries

Prospects are still good for retrieval of the Long Duration Exposure Facility (LDEF) during the STS-32 mission in December, and at least one JSC scientist says the bus-sized satellite may be worth more now that it would have been if retrieved on schedule.

STS-32 is scheduled for launch Dec. 18. On Dec. 21, LDEF is to be grappled with the remote manipulator system and placed in Columbia's payload bay.

LDEF, deployed by the crew of STS-41C in April 1984, is a 12-sided, open grid structure containing 57 scientific, applications and technology experiments on the effects of long stays in low-Earth orbit. Its planned February 1985 retrieval was delayed by other manifest priorities. Then the January 1986 Challenger accident grounded the entire shuttle fleet.

In return-to-flight manifests, missions to put Tracking and Data Relay Satellites (TDRS) into orbit and meet planetary mission windows took top priority. The result

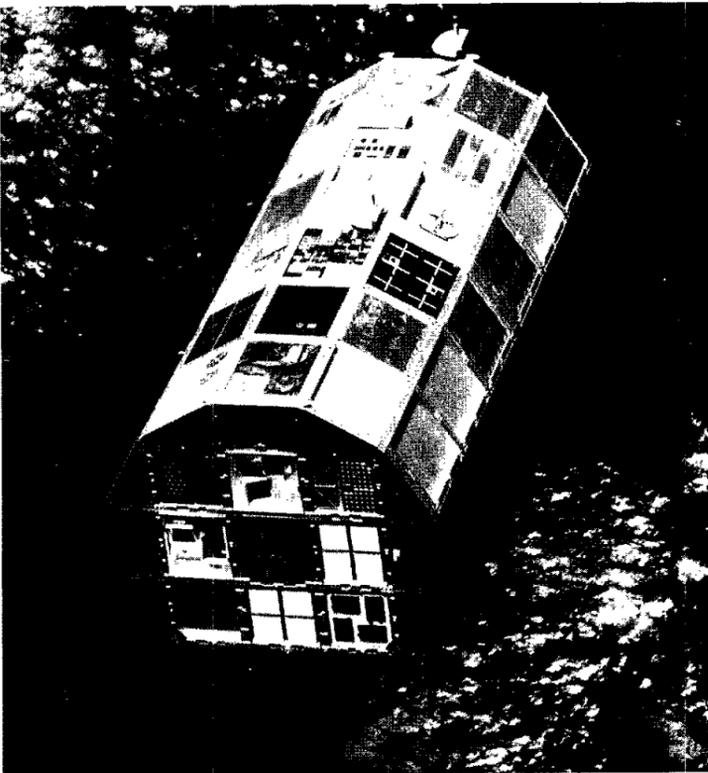
is that LDEF, originally scheduled to be in orbit for just under a year, will have been in orbit 5 1/2 years before it can be retrieved.

LDEF's orbit has been decaying and it will eventually re-enter Earth's atmosphere if not retrieved, but according to two JSC trackers recent solar flare activity has not caused any significant acceleration in orbital decay.

Gautam Badhwar, a physicist in JSC's Space Science Branch who predicted to within a day last month's re-entry of the final piece of orbiting Apollo hardware, said that on the scheduled retrieval date LDEF's orbital perigee should be 172 nautical miles. According to his predictions, based on tracking data from the U.S. Space Command and solar flux values from the National Oceanic and Atmospheric Administration, LDEF will be retrievable through Jan. 25, 1990.

That prediction jibes with the "lifetime predictions" of Cheryl Andrews in JSC's Orbit Analysis Branch. Andrews said LDEF is

Please see **RETRIEVAL**, Page 4



The Long Duration Exposure Facility (LDEF) is framed by a backdrop of blue ocean waters moments after deployment from *Challenger* in April 1984.

NASA Photo

## Galileo goes to pad today; Atlantis set for Monday roll out

By Kyle Herring

Preparations for transfer to the launch pad of Space Shuttle *Atlantis* continue to go smoothly with roll out scheduled for Monday. Its payload—the Galileo planetary spacecraft—was to be moved to the pad today.



*Atlantis* was rolled from its hangar in the Orbiter Processing Facility (OPF) early Monday and was mated with its solid rocket booster/external tank stack by Wednesday.

Work then began to conduct interface verification tests (IVT) between the orbiter and stack. The IVT verifies that all connections are made correctly and no problems exist prior to the vehicle's roll to the launch pad.

Late this week, workers mated the tail service masts on the mobile launch platform to the orbiter. Connections of the hydrogen and oxygen umbilical cables between *Atlantis'* belly and the external tank also were completed this week.

Please see **GALILEO**, Page 4

JSC

# Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays. A calendar of Employee Activities Association events is now available on the PROFS computer network.

General Cinema (valid for one year): \$3.50 each.

AMC Theater (valid until May 1990): \$3 each.

Sea-Arama Marineworld, Galveston (valid until Oct. 17, 1990): adults, \$8.15; children \$5.10.

Sea World (San Antonio, year long): adults, \$17.25; children \$14.75.

Palm Beach at Moody Gardens (valid until September 1989): adults \$2.75; children \$1.50.

Astroworld (valid 1989): adults, \$14.12; children under 4, \$11.99; Waterworld (valid 1989): \$8.15.

Six Flags (valid through 1989): \$14.12.

Texas Renaissance Festival (open every weekend from Sept. 30 through Nov. 12): adults, \$8.95; children \$4.95.

Deep Sea Fishing Trip (Sept. 23, 7:30 a.m.-7:30 p.m., New Buccaneer leaving Galveston Pier 19): fishing, \$45; riding, \$20.

FBA-FEB Family Day at Astroworld (Aug. 27, flyers with coupon available at Bldg. 11): \$9.95.

JSC

# Gilruth Center News

**Sign up policy**—All classes and athletic activities are first come, first served. To enroll, you must sign up in person at the Gilruth Recreation Center. Everyone will be required to show a badge or EAA membership card. Payment must be made in full at the time of registration. Classes tend to fill up four weeks in advance.

**EAA badges**—Dependents and spouses may apply for a photo I.D. 6:30-9:30 p.m. Monday-Friday.

**Defensive driving**—Course is offered from 8 a.m.-5 p.m., Sept. 16 and Oct. 14; cost is \$15.

**Weight safety**—Required for use of the Rec Center weight room. Classes will be 8-9:30 p.m. Sept. 6 and 21; cost is \$4.

**Aerobics and exercise**—Both classes are ongoing; cost is \$24.

**Tennis lessons**—Beginning tennis lessons, Mondays 5:15-6:45 p.m. starting Aug. 21; six-week course is \$32.

**Soccer and football sign-ups**—Registration will be Aug. 31. For more information, pick up a flyer on the guidelines and procedures.

**Basketball sign-ups**—Fall basketball league registration will be held the week of Aug. 14. NASA badged teams will sign up first.

JSC

## Today

**Voyager watch**—Dr. Faith Vilas of JSC's Space Science Branch, will narrate "Blue Room Updates" covering the previous day's *Voyager 2* activities from noon-1 p.m. Aug. 25 in Teague Auditorium. The auditorium will be open from 6-7:30 p.m. for live pictures from *Voyager* and a discussion of the mission by a JSC astronomer from 6-7 p.m. In Houston, an edited tape of *Voyager's* encounter with Neptune will be shown from 7:30-9:30 p.m. in the Atlantic Room of the University Center at the University of Houston (UH) Central Campus; a model of the *Voyager* spacecraft will be displayed. The free session is sponsored by the Houston Space Society and the University Space Society at UH. For more information, call Richard Braastat, 520-6924.

**Cafeteria menu**—Special: Salisbury steak. Entrees: baked scrod, 1/4 broiled chicken with peach half. Soup: seafood gumbo. Vegetables: cauliflower Au Gratin, mixed vegetables, buttered cabbage, whipped potatoes.

## Sunday

**Voyager watch**—Lectures concerning the *Voyager 2* encounter with Neptune will be presented from 3:30-5 p.m. Aug. 27 in the Clear Lake Auditorium, Bayou Bldg., University of Houston-Clear Lake (UHCL). The free event is sponsored by JSC, UHCL and the Lunar and Planetary Institute. For more information, call Richard Braas-

atd, 520-6924.

## Monday

**Voyager watch**—Dr. Faith Vilas will narrate "Blue Room Updates" from noon-1 p.m. Aug. 28 in Teague Auditorium.

Cafeteria menu—Special: beef and macaroni. Entrees: ham steak, Parmesan steak. Soup: chicken and rice. Vegetables: green beans, carrots, Au Gratin potatoes.

## Tuesday

**Voyager watch**—Dr. Faith Vilas will narrate "Blue Room Updates" from noon-1 p.m. Aug. 29 in Teague Auditorium. Dr. David Black, Lunar and Planetary Institute director, will emcee the final day of live *Voyager* video from 6-7:30 p.m. in Teague Auditorium.

**SOMS kickoff**—The local Space Operations and Mission Support (SOMS) AIAA Technical Committee kickoff meeting will be 11:30 a.m.-12:30 p.m. Aug. 29 in Bldg. 4, Rm. 1042, side B. The committee will address operations and technology development relating to manned and unmanned missions, Earth orbital and planetary operations, support, training, servicing and logistics. The meeting was rescheduled because of Hurricane Chantal. For more information, call Sonya Sepahban, 283-5310.

**Cafeteria menu**—Special: Mexican dinner. Entrees: potato baked chicken, barbecue spare ribs. Soup: tomato. Vegetables: squash, ranch beans,

Spanish rice, broccoli.

## Wednesday

**Toastmasters to meet**—The Spaceland Club of Toastmasters International will hold a humorous speech contest at its next meeting, which begins at 7:15 a.m. Aug. 30 in the Bldg. 3 cafeteria. Call Liz Duffy-Towner, x31543, for more information.

**Cafeteria menu**—Special: baked meatloaf with Creole sauce. Entrees: baked scrod, liver and onions, ham steak. Soup: seafood gumbo. Vegetables: beets, Brussels sprouts, green beans, whipped potatoes.

## Thursday

**JSC Blood Drive**—The third on-site JSC Blood Drive of the year will be from 8 a.m.-noon and 1-3:30 p.m. Aug. 31 at the Gilruth Recreation Center. For appointments, call Bob Jones, x33004; Mary O'Rear, x36531; or Helon Crawford, x34159.

Cafeteria menu—Special: smothered steak with dressing. Entrees: chicken and dumplings, corned beef with cabbage. Soup: beef and barley. Vegetables: spinach, cabbage, cauliflower au gratin, parsley potatoes.

## Sept. 1

**Cafeteria menu**—Special: tuna and salmon Croquette. Entrees: pork chop with yam rosette, Creole baked cod. Soup: seafood gumbo. Vegetables: Brussels sprouts, green beans, buttered corn, whipped potatoes.

# Swap Shop

## Property

Sale: Meadowgreen, 3-2-2, lg. cov. patio, \$13K equity, assum. 9.5% FHA w/release. 486-8463.

Sale: 60 acres, 3 mi. from Karnes City, TX, on Hwy. 80, 50 mi. from San Antonio; lg. 2-story house in El Campo, TX, on 1.5 lots w/many fruit trees. 783-9164.

Sale: League City, brick 3-2-2, lg. bkdy. w/pool, C/AH, cath. ceiling, cul-de-sac, near NASA, \$58,000, FHA 8 3/4 assum. Jim, x31670 or 334-3069.

Sale: Forest Bend, 4-2-2, lg. brick FPL, fen. yd., cov. patio, miniblinds, GR, CC sch., \$55,900. 482-4859.

Rent: Crystal Beach cabin, sleeps 7, A/C, \$200 dep., \$325/wk. 409-832-2582 or 409-755-1638.

Sale/Lease: Baywind II: one BR apt. for rent, 1st floor, ex. cond., \$300/mo., plus sec. dep.; Baywind I: one BR apt. for sale, 1st floor, ex. cond., \$22,950, assum. mortg. \$23-1000.

Sale: Friendswood 3-2-2D, nice neighborhood, lg. mas and LR, \$66,500. 482-7102.

Sale: Remod. 3-2-2, 1,800 sq. ft., formals, lg. den w/FPL, brick, deck w/spa, assume at 9.875%, must qualify, never flooded, \$72,900. Richard, x30271 or 474-9334.

Rent: Baciliff mobile home lot \$85/mo., \$50 dep., Oklahoma and Kinne. 488-1758.

Lease: Pebblebrook condo, 1 BR, W/D, ceiling fan, \$325/mo., \$200/dep., no pets. Aggie, 280-1989 or Chris, 282-2667.

Sale: 2-yr. metal bldg. on approx. 1 acre, now being used as a grocery store, room for mobile home or homesite, pecan trees, near Crockett, TX. 486-9760.

Sale: Brazos Country development, 1.6 acres, elec. and water, \$19,500. Linda Center, 589-8303 or 392-5594.

Rent: Pasadena, Parkview South subdiv., 3-2-2, FPL, \$600/mo. Dave, x32210 or 487-6073.

Sale: Friendswood/Sun Meadow Estates, estab. neighborhood, cul-de-sac, approx. 245' deep and up to 86' wide, util on site, \$29,500. Doug, x32860 or 486-7412.

Sale: Bayou Vista canal lot w/ bulkhead, 617 Warsaw, \$5,500. OBO. Rob, x33195 or 332-3077.

Sale: CLC, Middlebrook, 3-2-2, fen. corner lot, FPL, window furn., ceiling fans, assum. 7.65% FHA loan. 486-6544.

Rent: El Dorado Way condo, 1 BR, study, W/D, FPL, \$550/mo. Pam, 282-4678.

Lease: Univ. Trace condo, lg. 1-1-2, dwn. str., near JSC, W/D, FPL, \$320 plus dep. Gilbert, 333-4306.

Lease: CLC, Oakbrook West, 4-2-5-2D, contemp. lg. LR/DR, FPL, gar. opener, no pets, \$895/mo. 482-6609.

Lease: CLC, Baywind I condo, 1-1, FPL, ceiling fan, \$310/mo. 333-6692 or 488-1988.

Lease: Univ. Green patio home, 3-2-2, fans, gar. opener, avail. Sept. 1, \$700/mo., \$700/dep., and ref. 486-8551.

Sale: Big Bend area, 160 acres, \$140/acre, CFD 20% down, 9% for 5 yrs. 337-4051.

Rent: Lake Travis cabin, priv. boat dock, CA/C and heat, fully equip., accomm. 8, wkly./daily rental, \$325/\$75, after 9/1. 326-5652.

Rent: League City, Newport subdiv., 2 BR in 3-2 house, \$250/mo., bills split evenly, non-smokers only, sm. pet tolerated. Russ, x39130 or 554-5900.

Lease: CL condo on Tranquility Lake, avail. Sept. 1, 1989, refrig, microwave, W/D, cable T.V. hookup, \$330/mo., \$150/dep. 554-6892.

Sale: Gulf Meadows, brick 3-2-2, den w/FPL, formals, storm windows, 5 ceiling fans, 12' x 26' screened patio, never flooded, \$59,500. 282-4085 or 991-1121.

Lease: New Heritage Park, 3-2-2, 5 yr. old, \$660/mo., dep., no pets, or sale for \$67,000. x35021 or 482-5615.

Rent: Utah ski snowbird, 5 days during Thanksgiving, \$525. Ken, 333-2636.

Sale/Lease: El Lago, 4-2, lg. fen. yd., \$78,900/\$850. 532-4237.

Rent: Piper's Meadow, 2-2-2D, lg. yd., 3 mi. from NASA. 486-5659.

## Cars & Trucks

'84 Mercury Grand Marquis Colony Park, loaded, good cond., \$4,800. 473-2709.

'71 VW bug, rebuilt eng., good cond., \$1,300. 282-4059 or 480-9482.

'78 Corvette, Silver Anniv. Ed., new 2-tone silver paint w/white int., T-tops, all pwr., 14K on new Vette eng., rebuilt brakes, suspension, \$8,750, OBO. Richard, x30271 or 474-9334.

'81 Ford F150 PU Lariat pkg., ex. cond., motor rec. overhauled, \$3,000. 486-0462.

'81 Toyota Celica, blue, new paint, 5 spd., 59K mi., ex. cond., very depen., A/C, AM/FM, tinted windows, \$2,000. x36186.

'85 Toyota Corolla SR5, red, 2 dr., loaded, ex. cond., like new, \$5,400, OBO. x37344 or (409) 938-7570.

'79 Honda Civic, 4 spd., no A/C, new tires, exhaust sys., clutch, CV joints, struts, rebuilt eng., fair body, \$1,295. x33617 or 896-6347.

'85 Pontiac 6000LE, low mi., PS, PB, tilt, cruise, V-6, A/C, P/W, gauges, \$5,500. Matt, x34285 or 486-7260.

'82 Cutlass Supreme, good body/tires, needs minor repairs, \$2,350, OBO. Carl, 488-4412.

'84 Chevy Celebrity, 4 dr., auto., A/C, P/W and door locks, cruise, tilt, AM/FM, radio w/tape deck, metallic brown, \$5,500. Edward, x36250 or 481-4889.

'78 Datsun 280Z, 4 spd. stick, clean, \$2,195. x35180 or 326-3706.

'67 Ford F250, red iron paint, ex. cond., chrome rear step bumper, \$3,500. Rick, x35571.

'84 Chevrolet Monte Carlo, PW and locks, cruise, tilt, white/blue int., new trans., \$6,300. x36346 or 486-0389.

'83 Citation V-6 auto., A/C, immac. cond., very depend., full maint. sched., \$3,000. Bruce, x35571.

'85 35' Mallard motor home, loaded, low mi., \$40,000. 337-4051.

'87 Firebird, T-top, alarm sys., AM/FM/cass., P/W, cruise, 30K mi., \$8,800. Jackie, x37426 or 326-5200.

'83 Toyota Celica, stand. shift, new paint/tires, 92K mi., \$2,500. 280-8546 or 282-4051.

'76 Mercedes, 300D, low mi., ex. cond. Jerry, x39287 or 554-6093.

'72 Buick Skylark, 2 dr., 350 4bbl., dk. metallic gr. on bottom, it. gray on top, completely restored, ex. cond., \$3,500. Jan, 480-8190 or 409-945-6894.

'68 Chevelle SS, 350, 4 spd., red, good cond., \$2,800. Neal, 331-3525.

'75 F100 Ranger PU, V-8 302 CID eng., auto., P/S, P/B, AM/FM cass., w/air corb. rebuilt, new mufflers/seat cover, eng. runs good/body O.K., \$950, OBO. 333-6558 or 339-1337.

'82 Honda 4 dr., auto., A/C, cruise, \$3,850 or '80 Toyota Corolla liftback, new Michelins, 5 spd., A/C, \$2,350, will sell one only. x30092 or 481-3637.

'88 S-10 PU, ext. cab, 5 spd., A/C, 4 cyl., black w/dk. windows, spec. wheels and tires, perf. cond., 22K mi. 333-9281 or 334-3027.

## Boats & Planes

'79 Witchcraft ski boat w/trlr., 175hp Johnson OB, low time, \$6,000, will consider trade for like value car/truck. 532-1206.

'16' Hobie, custom sail box, galv. trlr., stored indoors, like new, \$2,500. 538-1148.

'16' Chrysler fiberglass tri-hull, needs floor work, 100hp Evinrude, O/B, Sportsman galv. trlr., \$1,650, OBO. Linda, x31168 or (409) 925-4862.

'78 19' Renken Bowrider, 170hp fresh wtr. cooled Mercruiser I/O, galv. EZ loader trlr., depth finder, runs great, good cond., \$4,000. 532-3515.

'88 18' Phantom ski boat w/trlr., like new, low hrs., \$10,500. Kurt, x35572 or 337-2268.

'86 Jetski 550cc, w/4x8 util. trlr., \$1,800, OBO. 282-4585 or 409-948-4507.

'67 18' Correct Craft, inboard wng. w/low hrs., perf. cond., almost new trlr., \$3,000. 282-2810 or 480-3909.

Catamaran Aquacat 14.5, ex. cond., yellow hulls, yellow/red sail, \$750. 474-7248.

'16' Hobie Catamaran, 2 sets of sails, harnesses, traps

and life jackets, trlr. optional, BO. John, x38988 or 482-6364.

## Cycles

'82 Yamaha 650, blk., new tires, good cond., \$750 or trade for IBM comp. PC. Jim, x31670 or 334-3069.

'82 Honda Magna V-4, 2,400 mi., ex. cond., \$1,500. 532-1206.

'82 Honda Nighthawk 650, good cond., runs great, 11K mi., \$1,075, OBO. Kelvin, x36905 or 488-8173.

'82 Honda VF750 Sabre, sport touring fairing and lowers, Hondaline saddle bags, new tires, \$1,750. Richard, 480-0880.

'88 Honda Prelude (Si), A/C, auto. trans., moon roof, low mi., like new, \$14,000. Kurt, x35572 or 337-2268.

Yamaha YZ-125 dirt bike, Basket Case, compl., \$50. John, x38178 or 482-5837.

Yamaha QT Moped, \$400, incl. Moped, helmet, Kryptonite lock, basket w/bunge cords, cur. lic. plates, ex. cond., less than 1,400 mi. 481-3946.

Honda dirt bike, XR 80, \$400; XR 100, \$600, low hrs., ex. cond., trlr., \$300. Gary, x33786 or 499-5786.

## Audiovisual & Computers

AT&T 6300, color sys., 640 KB RAM, 768 KB exp. mem., 2 360 KB floppies, 2 parallel, 2 serial, game port, mouse, DOS, other software, \$1,200, 40 MB plus Hardcard, \$450, both, \$1,600. Charlie, 488-8806 or 488-4578.

Ashton Tate's D-Base for McIntosh, \$100, OBO. 280-8006.

Personal comp., \$85, teletype term., \$240, Beehive term., \$150, Microfiche viewer, \$65, Oscilloscope, \$80, NCR acct. mach., \$45, card disp. case, \$40. Walter, x37332.

Commodore 64 w/1541 disk drive, games, \$190; B/W T.V., 13", new, \$50. Bui, x30223 or 481-6486.

Commodore 64 w/1541 disk drive, \$200. Robert, x33742 or 554-6631.

Victor PC II, IBM compat. 640 K RAM, 20 meg hard drive, 360 K floppy, ext. keyboard, green monochrome monitor, graphics card, 8086 based, w/software: Microsoft Word, Lotus 123, DOS, Checkbook Program, Basic, Typing Tutor, Children's games, \$700. Donna Peterson, 468-3280 or 749-4158.

Epson FX-80 printer, \$125; Osborne 1 portable (Z80A, 64K, dual floppy), \$150. Ken, x38244.

## Household

Montgomery Ward's heavy duty washer, works but leaks, \$50; baby cradle, finished white pine, \$100. 996-8410.

Pitt group sofa, lg., steel blue, recliner on each end, less than 1 yr. old, ex. cond., paid \$1,200, will take \$850. Jan, 480-8190 or 409-945-6894.

Domestic sewing mach., cabinet mod., \$75. 946-7587.

Rattan loveseat, chair, table, white, ex. cond., \$500. Theresa, 944-5150.

Captain style twin bed, 2D underneath, matt. ex. cond., \$150. 280-8006.

Herculon 4 pc. sect., \$200; cocktail table, \$50; queen bed, triple dresser, side chest, bach. chest, 2 lamps, \$495; 4 chairs, \$120, OBO. 941-2495.

Big Sur kingsize waterbed, 1 yr. old, all access., heater incl., bookshelf hdbd., \$300. Greg, 282-4263 or 488-2082.

Dining table, solid oak, butcher block style, rec., 7' x 3' w/6 solid oak cane bottomed chairs, plain style table, \$750, OBO. Patrick, x32635 or 488-1079.

Sear's 6 cu. ft. refrig. w/three drawers, crisper, \$160, 4 mos. old. 482-1505.

Small dining table w/folding sides and 2 chairs, \$50. 486-0830.

Large 2-pc. wall unit, colonial bookcase, 7' x 8' x 20". 482-9735.

26" Sony Trinitron T.V. console, modern, dk wood cab.; Matrix sound, rem., cable ready, perf. cond., \$450. Elyse, x37764.

China cabinet w/2 glass doors/light inside, shelves ins. and bottom, 3 drawers in front and 2 drs. on bottom, very good cond. Mary L., 479-6862 or Becky, x36530.

Early American couch, brn. tone, \$125, rec./rockers,

brn. plaid, \$65. Ed, x36250.

Ward's 10.1 cu. ft. upright freezer, \$150, almond, runs perf., no def. Ron K. x34713 or 333-2273.

2 high back bar stools, uphol. seats, inset cane backs, \$75. Bob, 488-0397 or 283-5469.

Microwave oven, lg. cap., like new, \$120; sofa and rec., brn./rust, like new, \$300. 996-8633.

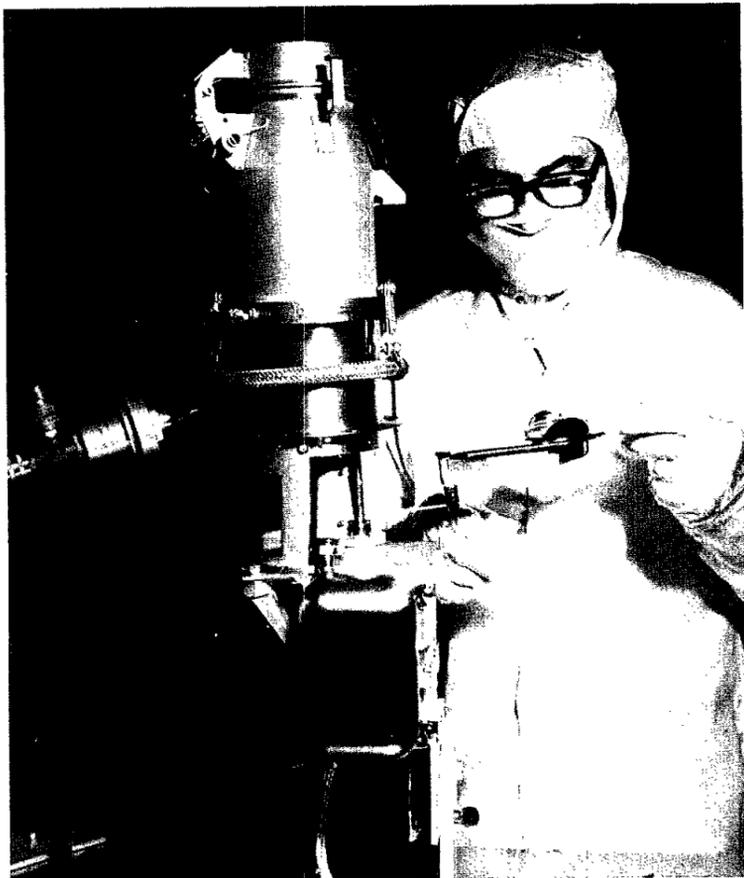
Ward's upright 16 cu. ft. freezer, white, \$75. 585-8162.

3 pc. LR set, \$250, OBO; RCA 25" color con. T.V., \$250, OBO, good cond. Jana, x31653 or 326-4030.

Girl's 3-pc. twin BR set w/matt. and boxsprings, incl. bed, chest of drawers/bookcase, new computer desk w/overhead. x30032 or 488-2146.

Grandfather clock, Ridgeway, ex. cond.,

# WHITE SANDS



## An environment more demanding than space

[Editor's note: This is the first of two articles on White Sands Test Facility, 60,000 acres of desert that people sometimes forget is an important part of JSC. Part 1 is an overview of the varied nature of White Sands' work. Part 2, to be published Sept. 1, will provide a more in-depth look at the facility and its work.]

By James Hartsfield

There's a distant part of JSC where the air is almost always dry; where they take things designed here and see if they really work; where they can make steel burn like paper and steam go faster than sound; a place where sometimes the main job is to make something break—and it's a place where the Texas flag doesn't fly.

Almost a thousand miles west of Houston, flanked by century plants, cactus, rattlesnakes and mountains, White Sands Test Facility (WSTF) is as different from its parent center on the outside as it is on the inside. The bond they share is in the final results of their work. In amazement, intensity, importance and enthusiasm, their tasks are common. Simply put, WSTF's job is to conduct hazardous tests so risks can be minimized for others.

"We take those risks under carefully controlled conditions," explained Ray Melton, technical assistant to the WSTF manager, "so NASA can be certain they have been completely addressed and either eliminated or fully understood, and so the ground crews or astronauts

won't have to take them."

WSTF, located about 16 miles from Las Cruces, N.M., can be both enemy and friend to engineers, because it is there that the truth is told about the best-laid designs. If it can't make it through a test at WSTF, it won't go into space. It will go back to the drawing board.

"It's our job to ferret out any weaknesses in a concept or execution of a concept in hardware. But it's not a case of if you want something burned up, send it to WSTF," Melton said. "If you want to know whether your unit will make it in the environment of space, send it to WSTF. And if it won't make it, we'll help you come up with something that will."

Long before the lunar module Eagle first set men on the Moon in July 1969, the engines that sent them there, allowed them to land and launched them back home had rumbled time and again across the New Mexico desert. The first rocket engine, a test of the Apollo service propulsion system, was fired at WSTF 25 years ago this September.

Built in 1964 to support ground testing of the spacecraft propulsion systems planned for the Apollo Program, WSTF remains one of the premier facilities in the world for propulsion testing. Some of the more spectacular propul-

sion work that has permeated its history includes testing of the Apollo and Skylab spacecraft propulsion systems; testing of the Viking Mars Lander descent engine and its effect on simulated Martian soil; and certification of the shuttle orbital maneuvering system (OMS) and reaction control system (RCS). The first rocket engine was fired at White Sands in 1964, and, in the ensuing years, more than 310 engines have been tested in more than 2.1 million total firings. For JSC, WSTF's propulsion work certifies that manned spacecraft on-orbit engines are safe.

"Man-rating has always been a very difficult aspect of our tests," Melton said. "You deal with high performance versus stability and safety of a propulsion system."

WSTF also is a recognized leader in materials testing, an area of work that began in earnest following the 1967 Apollo 204 spacecraft fire that claimed the lives of three astronauts. More than 90 percent of all the non-metallic materials flown during the Apollo, Skylab and shuttle programs to date have been checked out beforehand at WSTF. Materials testing can range from checks of the flammability and odor emissions of crew clothing to exhaustive tests of piping and wiring. Studying fire — what burns

under what conditions and how things burn — has been a leading area in White Sands' testing. Notable work has included analysis of intentionally set aircraft fuel fires from both within and without to provide the U.S. Navy with a profile to better control such fires on an aircraft carrier. WSTF studies how things burn in pure oxygen, an atmosphere that can make metals, even steel, burn like paper. The labs also analyze explosions and the explosive potential of various propellants, especially when in pressurized containers such as spacecraft fuel tanks. And chemicals are checked to measure their reactions with other materials which they may contact on a spacecraft.

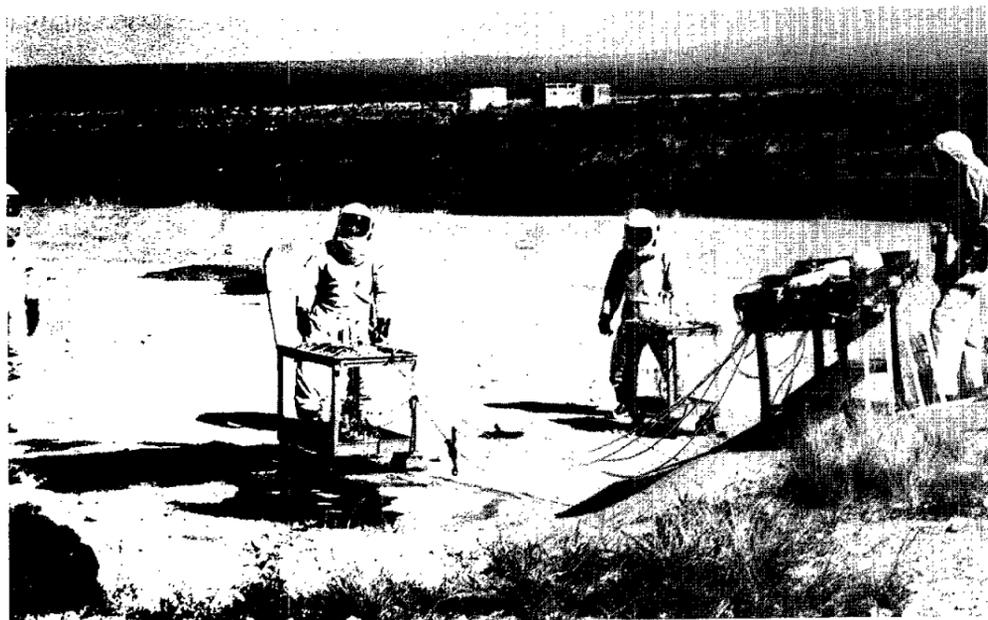
"The majority of the tests we do were developed here," said David Pippen, chief of WSTF's Laboratories Office. "What we try to do is characterize those materials on Earth so that we can depend on them in space. We started really where no one had been and have gone on from there."

WSTF also operates the only Shuttle landing strip for which JSC is responsible — White Sands Space Harbor (WSSH), located on the fringe of the White Sands National Monument. *Columbia* landed at WSSH to end the third Shuttle flight, and, in addition to being a back-up landing site, the Space Harbor is used daily by astronauts to train in the Shuttle Training Aircraft.

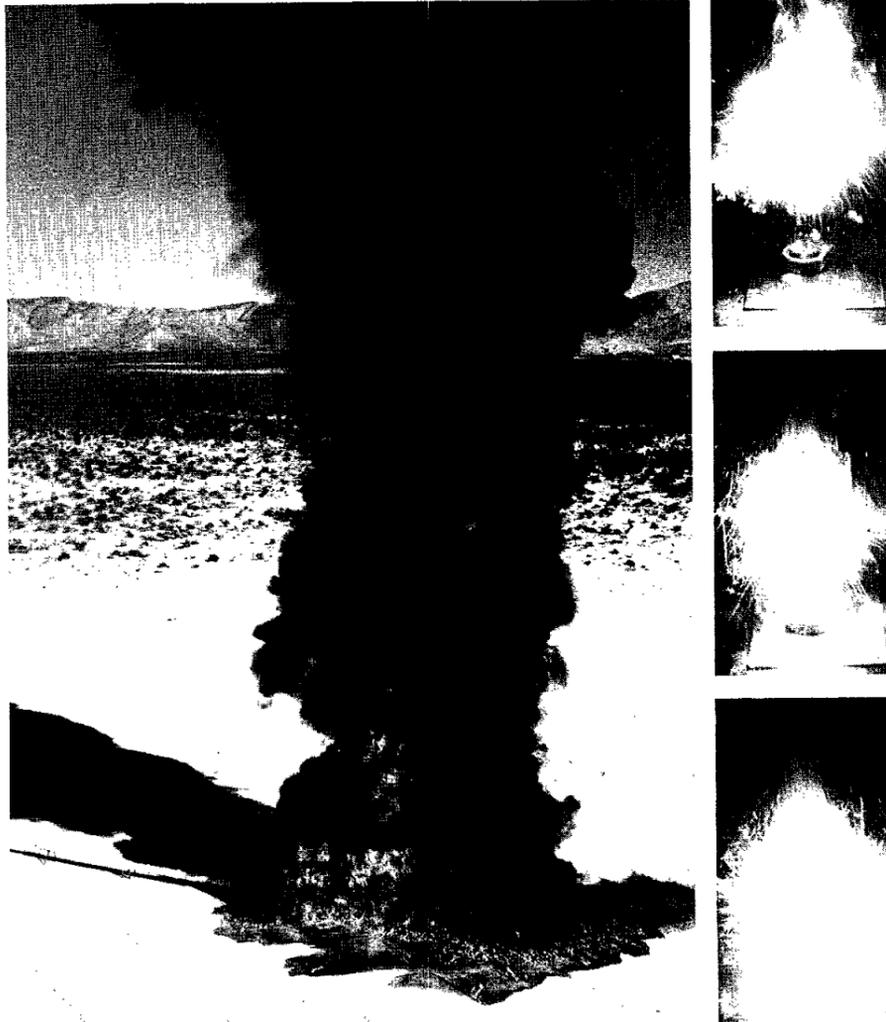
NEXT WEEK: A WORLD-CLASS LAB

**'If you want to know whether your unit will make it in the environment of space, send it to WSTF. And if it won't make it, we'll help you come up with something that will.'**

—Ray Melton



Recent events at White Sands Test Facility (WSTF), a little-known part of JSC to many employees, have included: 1) top left, the landing of *Columbia* on STS-3 at White Sands Space Harbor; 2) top right, precision cleaning of the *Viking* Mars lander's soil sampling probe in a WSTF Class 100 clean room; 3) above, work with rocket propellants where WSTF technicians wear Self-Contained Atmospheric Protective Ensemble (SCAPE) suits identical to those worn by Kennedy Space Center workers when fueling an orbiter; 4) right, a jet fuel fire intentionally set in 1981 as part of a study of aircraft carrier deck fires to help the Navy better control them; and 5) far right, time sequence photography of titanium burning in an oxygen enriched environment as part of WSTF's studies of metals flammability.



# Voyager may confirm JSC astronomer's ring arc theory

(Continued from page 1)

moon Nereid and continued on to its 3,000 mile brush across the cloudtops of the planet, before its closest approach (within 24,000 miles) to Triton this morning.

Scientists are eagerly awaiting reports on that peculiar celestial body, the only moon in our solar system known to have a retrograde orbit, and one of only two known to possess an atmosphere.

As Voyager 2 neared its encounter with our solar system's outermost planet, the ranks of Neptune-watchers filled Teague auditorium to near-capacity for daily live video and press

conference transmissions from JPL. Tourists, students, and employees on lunch breaks joined journalists, scientists and backyard stargazers for the open-to-the public events, moderated by either Dr. Jay Apt, astronomer and planetary scientist; Dr. Faith Vilas, astronomer, Space Science Branch; or Dr. David Black, Lunar and Planetary Institute.

Vilas, who is hosting the noon-1 p.m. program daily, has both a personal and professional interest in Voyager's observations, since the spacecraft's recent detection of Neptunian ring arcs (broken rings) backs up a theory presented on partial rings

in a paper she co-authored while working on her doctorate in planetary science at the University of Arizona in Tucson.

"We (a group of seven astronomers) had to base our theory on Earth-based observations we made of Neptune from different observatories during an occultation (the interruption of light from a star by a solar system body passing between the star and the Earth)," explained Vilas.

Speculation on the possible presence of complete Neptunian rings in addition to, or instead of, partial ones doesn't surprise her.

Vilas hadn't actually expected to

see evidence of the partial rings (a feature that would be unique to Neptune within the solar system) until after Voyager had passed its closest encounter and began looking back at the planet as the spacecraft hurtles toward deep space. "Forward scattering of the light enhances the particles, making them easier to see," she explains. The long-awaited encounter, with all its surprises, is "exciting" and "impressive" to her, "not just because the newly found features are so different, but because they are different in different ways."

Vilas stepped into her role in JSC's daily Voyager program having just

returned from Ecuador, where she observed another occultation.

A JSC employee for five years, Vilas feels lucky to have the opportunity to participate in these occasional astronomical observations in addition to her regular assignment of working on space-based detection of orbital debris.

JSC's Voyager program will continue in Teague auditorium today from noon-1 p.m., tonight from 6-7:30 p.m., Monday and Tuesday at noon-1 p.m. and the final live broadcast of Voyager's images will be Tuesday night from 6-7:30 p.m. The public is invited to attend.

## Galileo mission work proceeding

(Continued from Page 1)

If all goes well, Galileo and its inertial upper stage booster will be carefully transferred from the special "clean room" in the rotating service structure to Atlantis' payload bay to begin payload/orbiter interface checks along with final launch processing.

The STS-34 mission will be commanded by Don Williams, who was the pilot on STS-51D aboard *Discovery* in April 1985. Mike McCulley will be making his first Shuttle flight and will serve as pilot.

Missions specialists for *Atlantis'* fifth flight are Shannon Lucid, Franklin Chang-Diaz and Ellen Baker. Lucid flew as a mission specialist on STS-51G in June 1985 and Chang-Diaz flew as a mission specialist on STS-61C in January 1986. Baker is making her first Shuttle flight.

The crew will travel to Kennedy Space Center Sept. 11 for the traditional terminal countdown demonstration test (TCDT) to go through procedures that will take place on launch day.

Launch of *Atlantis* and Galileo on STS-34 can occur during a six-week period beginning Oct. 12. On Oct. 12 the launch "window" extends from 12:29 p.m. to 12:39 p.m. CDT. The window increases through Nov. 2, reaching a maximum of 47 minutes that day. It then decreases through the remainder of the launch period which closes Nov. 21.

The mission is planned to last slightly more than five days taking the crew around the Earth almost 82 times.



**BACK TO SCHOOL**—Employees selected to participate in this year's JSC Fellowship Program are packing their bags and heading for their respective universities for a year of advanced academic training on a leave with pay basis. Back row, from left: Henry Chen, working on his doctorate in Electrical Engineering at the University of Southern California; John Schliesing, working on a doctorate in Mechanical Engineering at the University of Houston-Central Campus; front row: Terri Murphy, working on a master's in Computer Science at Stanford; Leah Pate, working on a master's in aeronautics.

## Systems furniture to debut during Bldg. 4 open house

A new concept in office furnishings, called "systems furniture," will be displayed in a Sept. 1 open house on the second floor of Bldg. 4.

The pilot project is being funded by the Mission Operations Directorate (MOD), but may be the wave of the future for the rest of the center.

MOD's Training Division is hosting the open house from 12:30-3:30 p.m. All JSC and contractor employees are invited to attend. Six engineering stations near the entrance will be "personalized" to reflect a lived-in appearance, and information about the benefits of system furniture will be presented by NASA employees involved in the project and employees of Herman Miller, the furniture vendor.

Systems furniture is designed to provide safe, efficient work areas and to make the most of existing office space. This type of furniture already is in use in Washington, D.C., at Department of Defense Headquarters, Federal Aviation Administration Headquarters and the Department of State.

Center Operations Director Ken Gilbreath said his organization's Logistics Division is examining systems furniture for possible use throughout the center. If it is widely accepted and highly effective for workers, he said, systems furniture might be used to replace existing furniture through an extended phase-in program.

## Leland tribute set for Thursday

The JSC Black Cultural Association will present a gospel tribute to the late Rep. Mickey Leland from 11 a.m.-1 p.m. Thursday in Teague Auditorium.

Guests will include Cleo Glenn Johnson, Councilman Rodney Ellis, Alma Newsome, Bishop Olu Ufum and the Rev. William Lawson.

Today is the last day of a separate remembrance of Leland—a food drive at JSC with proceeds going to the Houston Food Bank.

Employees are asked to donate non-perishable food items from 7 a.m. to 5 p.m. at collection sites at Bldgs. 1, 3, 4, 11, 30, 45 and 419.

## Retrieval prospects good for aging satellite

(Continued from Page 1)

expected to drop to 160 nautical miles between mid-December and mid-January, and that the latest retrieval date would be in early January or February.

STS-32 Commander Dan Brandenstein said he is confident the mission can launch on time and be successfully completed as long as no unforeseen problems crop up.

"Getting *Columbia* off on time on STS-28 and having it come back in as excellent shape as it is all helps," Brandenstein said. "Mission integration is coming together nicely, and I was talking to Jay Honeycutt at the Cape recently and he's confident the flow there won't be a major problem."

Anne Ellis, flight integration manager for STS-32, said, "I think we're

in good shape with Dec. 18. I feel a lot better now that OV-102 had a good mission on STS-28, a clean mission."

In addition to retrieving LDEF, the crew will conduct a photo survey before placing it in the payload bay, she said. Some contamination is expected while LDEF is in the bay, and the photos will make a record of its orbital condition.

Designed and built at Langley Research Center, LDEF contains specific experiments of interest to scientists and engineers at JSC. Two JSC scientists are principal investigators for LDEF experiments. Lubert Leger is principle investigator for an atomic oxygen experiment, and Fred Horz is principle investigator for a micrometeoroid experiment.

Mike Zolensky, cosmic dust curator

in JSC's Planetary Science Branch, will be the curator for many LDEF surfaces once principal investigators here and elsewhere have completed their inspections. The surfaces will be cataloged and preserved in a separate laboratory of the same facility used for lunar samples. Some surfaces should begin trickling in by March, he predicted.

Zolensky is coordinating the efforts of the orbital debris/meteoroid special investigation group for LDEF. That group will work together to extract new data on orbital debris and micrometeoroid collisions in orbit both from individual experiments and from the LDEF structure itself.

For students of orbital debris and space station designers, every extra day LDEF is in orbit means better data.

"Now the value is increasing like an antique car," said Don Kessler, who in JSC's Space Science Branch is modeling the orbital debris environment. "The longer it stays up there the better in terms of the data we're getting now. But we're to the limit. It can't stay up any longer."

Kessler said LDEF is expected to provide better data on the make-up of the orbital debris population, especially about debris a few millimeters in diameter and smaller. Designers of spacecraft, Space Station *Freedom*, space suits and experiments need the information so they can devise adequate protection from debris collisions.

"We won't be able to duplicate that data for 10 years or more unless we get back LDEF," Kessler said.

## Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office for all space center employees.

## Nebrig named associate director

Daniel A. Nebrig has been named JSC associate director, effective Sunday. He had been executive assistant to JSC Director Aaron Cohen since April 1987.

Nebrig said increasing demands on the director and Deputy Director P.J. Weitz had led to an evolution of his duties and the reestablishment of the associate director position.

With the new title comes a broader responsibility to assist the director and deputy director in all aspects of the administration and technical management of the center.

Nebrig joined JSC in 1963 and has served in several key positions here. From 1976 to 1978, he was executive assistant to the associate administrator for space flight at NASA Headquarters.

## Buzzard assistant manager of NSTS Program Office

Frank Buzzard was named this week as assistant manager of the National Space Transportation System Program Office. He had been manager of the NSTS Project Integration Office since December 1987.

Buzzard brings 13 years of NASA experience to the position. He came to JSC's mission planning and analysis division in 1976 where he helped formulate and develop shuttle-

powered flight guidance functions for all mission phases. He also provided technical support to the guidance officer for shuttle missions.

In 1983 he became the on-orbit ground navigation and control technical manager of the Orbiter Avionics Office. In 1985 Buzzard became manager of flight software SSD until being named manager of project integration in 1987.

## Boykin deputy manager of engineering integration

Jack Boykin, manager of the NSTS Avionics Office, has been named deputy manager of the NSTS Engineering Integration Office. He will continue to serve as acting manager of the avionics office until a replacement is named.

Boykin was assistant, then deputy manager of the Orbiter Avionics Systems Office until late 1986 when he moved to the NSTS Avionics Office.

Boykin began his 24-year NASA career in 1965 as a coop student in the Electrical Power Distribution System Branch. He had been subsystem manager for solid rocket booster events control, principal function manager of shuttle system redundancy management design and performance, and ascent hardware/software coordinator.



Nebrig



Buzzard



Hartman



Chaffee



Woodfin

## Fitts new deputy chief of MOD Systems Division

Richard N. Fitts has been appointed deputy chief of the Systems Division in the Mission Operations Directorate (MOD).

Fitts, who joined NASA in 1971 as a flight control engineer, most recently had been chief of the Mechanical and EVA/Crew Systems Branch.

He has held several other supervisory positions in MOD, including head of the Propulsion Systems Section and head of the Communication Systems Section.

## Trio receives NMA honors

Three JSC executives have received the Silver Knight of Management Award from the JSC chapter of the National Management Association.

Harvey Hartman, Norman Chaffee and Daniel H. Nebrig received the awards as the three outstanding executives of the chapter during the past three years.

The recipients were selected on the basis of their ability to stimulate and inspire their fellow NMA members, their leadership in business relationships, their adherence to the NMA Code of Ethics and their contributions to the objectives of NMA.

## Program analyst wins tourney

Ken Woodfin, a program analyst in the Data Processing Systems Division, recently won the Men's Open Racquetball title at the Pepsi Games of Texas, a statewide tournament sponsored by the Texas Amateur Athletic Association. Woodfin won the tournament at the Downtown YMCA in Beaumont without dropping a game.